

## *Pandanus pistillaris* in the Caroline Islands: An Example of Long-Range Oceanic Dispersal

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IN CONJUNCTION with the current revision of the genus *Pandanus* (St. John, 1960; St. John and Stone, in sched.) it seems appropriate to mention the factors of dispersal operative in the genus. Since a number of species of *Pandanus* are littoral in habitat, and because at least one (if not several) species is found on nearly every tropical atoll in the Pacific, it has rightly been assumed that oceanic dispersal of the buoyant fruits is responsible for the distribution. There is no question that throughout vast island groups in Micronesia, Melanesia, and Polynesia *Pandanus* has long been part of the indigenous vegetation. There are, in fact, some indications that oceanic dispersal accounts for the farthest limits of the genus, in West Africa at one extreme, Polynesia at the other, the Bonin Islands in the north, and Australia in the south. The actual number of species involved is not yet known, but species of section *Pandanus* (section *Keura* of earlier authors; see St. John, 1960) play a prominent role, especially in the Pacific region. Certain species of other sections of the genus also are primarily ocean-distributed (for example, *Pandanus dubius* Spreng., and *Pandanus tetradon* (Gaud.) Balf.f.). In general, fruits of these species which are buoyant in seawater exhibit anatomical structures which are presumably adaptations to permit, or prolong, flotation. Brown (1931) has discussed the tissues present in fruits of certain Polynesian species, and uses the apt term aerenchyma to designate the light, pithy, upper mesocarp of such fruits. In addition, the seeds are encased in a highly

sclerified osseous endocarp which, except for the minute apertures at either end, are nearly impervious to water. Fruits of this type are capable of remaining afloat for a considerable period. No experiments or observations seem to be available, but it would appear quite probable that a period of 6 months or 1 year in the ocean would not be an exaggerated estimate of the time in which floating fruits could be dispersed by currents.

The vast areas encompassed by some of these species or groups of species with buoyant fruits, and the considerable taxonomic difficulties encountered in the groups, have not heretofore permitted any definite observations to be made with respect to direction of dispersal. Over a period of many years, and because of numerous observations, the knowledge of the currents in the Pacific is now in a position to be of value in problems of oceanic dispersal; but when grave doubt exists as to the nature (and number) of entities involved, little can be said except the obvious, that *Pandanus* species of littoral areas are probably ocean dispersed.

The specimen discussed below, however, because of its unique character, is a reasonably accurate indication of one route of oceanic dispersal. Because it represents a species which is a member of section *Intraobtusatus* St. John, it is at once distinguishable from the widely dispersed members of section *Pandanus*.

The specimen was collected by Dr. Ryoze Kanehira, late professor at Kyushu University, Fukuoka, Japan; the label reads, "Mokil Atoll; March 12, 1937, Kanehira no. 4203; nom. vernac. "arowan." Mokil Atoll is an isolated atoll roughly 110 mi. east of Ponape, at 6° 40' N., 159° 45' E., consisting of three islands on a circular reef. In April 1957 the present writer visited Mokil, spending the day of the 16th botanizing on the major islet. During this period, 15 numbers of *Pandanus* were collected (all of section *Pandanus*) and many vernacular names

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of plants. The name mentioned by Kanehira "arowan," is a general term used to designate any wild (i.e., nonedible) *Pandanus* or its fruit. The word is apparently of Marshallese origin, where the preferred spelling is "edwaan" (the *d* rolled like an *rr*). The other two islets of Mokil were not seen, so there is no corroborative information regarding the Kanehira collection. There seems no reason, however, to doubt Kanehira's data, and it is assumed that the specimen is indeed from Mokil.

The specimen consists of several phalanges, or keys, of the fruit. The configuration of the carpels which, fused, make up each phalange, determine the section of the genus, and the peculiar "focussed" pattern, as pointed out by St. John (1960) in his discussion of section *Intra-obtusatus*, is apparent. Although somewhat smaller than Martelli's description and figure indicate, the Kanehira specimen appears to be referable to *Pandanus pistillaris* Martelli. This species, and in fact the section itself, is known only from Melanesia, specifically, from the Bismarck Archipelago. Similar species, and a closely related section (*Lateriobtusatus* St. John) occur in New Guinea.

In December 1957 the author observed species of these sections—in particular, *P. pistillaris*—in their native habitats in New Ireland and New Britain. The trees are characteristic of lowland areas, although they may occur at altitudes of 300 m. or more. Frequently they are found along streams, and not uncommonly, near the coast, especially (as near Kavieng, New Ireland) on limestone. Phalanges which had fallen from these trees were occasionally seen as drift along the stream estuaries and along adjacent beaches around Kavieng and northwestern New Ireland. In this area, a considerable variation in fruit size was observed, much more than is indicated by Martelli's description; because of this, and the above factors, the Kanehira specimen, without much hesitation, can be placed as *P. pistillaris*.

If this is established, it is interesting to consider the possibilities for drift. One obstacle is our meagre knowledge of the full, natural range of *P. pistillaris*; there seems, however, to be little question that, if it is not actually endemic in the Bismarck Archipelago, it is restricted to that

general area. From a study of the excellent charts provided by Schott (1939) and by Wyrki (1957), it may be seen that a strip about 5 to 7° north of the equator and east of the 140° meridian, during both seasons of the year, is characterized by a more or less constant eastward flow, which in northern winter emanates from the Mindanao-Morotai region, and in northern summer emanates also from a strong current moving westward and slanting northward along the upper edge of the Melanesian area, but reversing its course in the Mindanao-Morotai region. The northern summer current spans a wider course along the equator, reaching nearly all of the Caroline Islands (except perhaps Palau and Yap) and proceeding possibly beyond the Marshalls. During this season, the route of a drifting object starting from New Britain or in that vicinity would be westward along the northern coast of New Guinea as far as Morotai, thereafter more or less directly eastward through Micronesia. During northern winter, counter currents forming a strong oceanic stream along the northern coast of New Guinea would prevent such a route of drift, while several minor whorl systems in the area bounded by the Admiralty Islands on the west and by the Solomons on the east would make the drift pattern irregular and unpredictable, possibly even somewhat southward. The actual number of miles and the elapsed time at sea must remain a matter of conjecture. No information is available as to the length of time over which floating phalanges may be viable; but indirect evidence (cf. Edmondson, 1941, for data on viability of coconuts after ocean flotation) appears to indicate that distances of 1,000 mi. or more are possible.

Thus it may be seen that the route of drift of an object afloat near the Bismarck Archipelago might, by the devious route outlined, terminate in Mokil Atoll or others of the Caroline Islands. Corroboration of such a route is available. Both Riesenberg (1959) and Sinoto (1960) have reported New Guinea canoe prows washed ashore in the Marshall Islands. Riesenberg (personal communication) has photographs of an entire canoe in the Marshalls which apparently drifted along this same route. Sinoto describes a New Guinea canoe prow which drifted to Nukuoro Atoll.

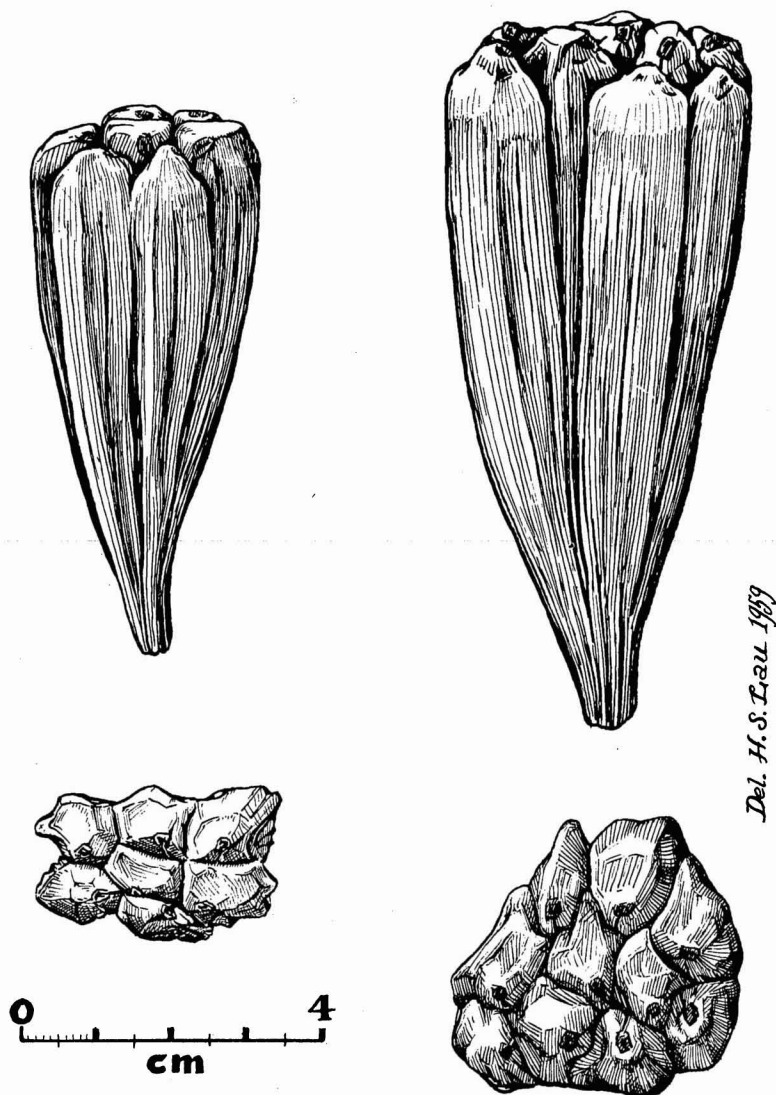


FIG. 1. *Pandanus pistillaris* Martelli. Phalanges in lateral view, natural size, and in top view. Drawn from Kanehira 4203 from Mokil Atoll, Caroline Islands.

It is postulated that the collection of *Pandanus pistillaris* in Mokil Atoll is a further example of such a route of drift. The Kanehira specimens (two of the several phalanges) are here illustrated (Fig. 1).

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